their positions by an alloy of zinc and copper, as easily wrought as common brass, and that they can be executed in this manner of any required size; that castings of the finest speculum metal can be executed of large dimensions, perfect, and not very liable to break; that machinery can be employed with the greatest advantage in grinding and polishing specula; that to obtain the finest polish, it is not necessary that the speculum should become warm, and that any temperature may be fixed upon, and preserved uniform during the whole process; and that large specula can be polished as accurately as small ones, and be supported so as to be secured from flexure.

2. On the theoretical explanation of an apparently new Polarity in Light. By G. B. Airy, Esq., M.A., F.R.S., Astronomer Royal.

The existence of a polarity in the rays of homogeneous light, having regard only to the sequence of colours in the spectrum, was inferred by Sir David Brewster from some experiments, of which he has given an account, contained in the Report of the seventh meeting of the British Association. The author states the results of his own observations of similar phenomena, and their theoretical explanation on the undulatory theory, together with the mathematical development of that explanation.

3. On the Ferrosesquicyanuret of Potassium. By Alfred Smee, Esq. Communicated by P. M. Roget, M.D., Sec. R.S.

The author examines, in this paper, the action of chlorine upon the ferrocyanate of potassa, and the conversion of the latter into ferrosesquicyanuret; and proposes methods for obtaining this latter salt uncontaminated with impurities, and free from the difficulties and inconvenience attendant on the present mode of preparation.

4. On the influence of Iodine in rendering several argentine compounds, spread on paper, sensitive to light; and on a new Method of producing, with greater distinctness, the Photogenic Image. By Mr. Robert Hunt. Communicated by Sir John Herschel, Bart., V.P.R.S.

This paper contains various details of the results of a great number of experiments made with a view of rendering paper capable of being employed instead of metallic plates, in Daguerre's photographic process. It is accompanied with 12 papers as specimens.

5. Hourly Observations of the Barometer and Thermometer at sea, on the 21st of March, 1840. By Major-General A. Lindsay, H.E.I.C.S. Communicated by Sir John F. W. Herschel, Bart., V.P.R.S.

These observations were made on board the ship Owen Glendower, on her voyage from Calcutta to London.

6. On the Constitution of Pigotite, and on the Mudesous and Mudesic Acids. By James F. W. Johnston, Esq., M.A., F.R.S.

In this paper the author describes a substance, found by himself

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and by the Rev. M. Pigot, forming an incrustation on the sides of certain caves, occurring in the granitic cliffs on the east and west coast of Cornwall. This incrustation is in mass of a brown, and in powder of a yellow colour; is insoluble in water and alcohol; when heated, it gives off much water, blackens, yields empyreumatic products, and leaves a black mass, having occasionally the lustre of graphite. In the air, at a bright red heat, this mass very slowly burns, leaving a grey or white ash, which consists of alumina, with some slight foreign admixtures.

The organic constituent of this substance (pigotite), the author considers to be derived from the decay of the various plants which grow on the moist moorlands above, and which, being carried by the waters into the fissures of the granite beneath, combines with the alumina of the decomposed felspar; and when it reaches the air, deposits itself on the roof and sides of the caverns, in the form of layers, varying from a line to two or three inches in thickness. With reference to its supposed origin, the author has given to the organic constituent the name of *mudesous* acid (from *μυδησις*, signifying decay through excess of moisture), and he mentions an observation, communicated to him by Dr. Bouse, that the roots of the sea pink (*Statice armeria*) contain a colouring matter resembling, *in appearance*, the solutions of the mudesous acid.

From numerous experiments and analyses detailed at length in his paper, the author derives the following general results:

1. That the native pigotite contains a dark-brown soluble, not deliquescent acid of vegetable origin, which, in the anhydrous state, is represented by $C_{12}\,H_5\,O_8$.

2. That this acid, the *mudesous*, is tribasic, the salt of silver (mudesite), being represented by $(3\,A_9\,O + C_{12}\,H_5\,O_8)$, and precipitates the salts of the metallic oxides of a brown colour.

3. That the native mudesite of alumina (Pigotite) is represented as follows:

a. Dried in the air by $(4\,\underline{\overset{\cdots}{\mathrm{Al}}} + C_{12}\,H_5\,O_8 + 27\,HO)$.

b. Dried at 212° F. by $(4\,\underline{\overset{\cdots}{\mathrm{Al}}} + C_{12}\,H_5\,O_8 + 8\,H\,O)$, losing 27 per cent. of water.

c. Dried at 300° F. by $(4\,\underline{\overset{\cdots}{\mathrm{Al}}} + C_{12}\,H_5\,O_8 + 8\,HO)$, losing 32 per cent. of water.

4. That this native mudesite, however, is more probably a compound of the organic tribasic salt, with a hydrate of alumina, and may be rationally represented thus:

a. Dried in the air by $(\underline{\overset{\cdots}{\mathrm{Al}}} + C_{12}H_5O_8 + {}_9HO) + 3\,(\underline{\overset{\cdots}{\mathrm{Al}}} + 6HO)$.

b. Dried at 212° F. by $(\underline{\overset{\cdots}{\mathrm{Al}}} + C_{12}H_5O_8 + 4HO) + 3\,(\underline{\overset{\cdots}{\mathrm{Al}}} + 2HO)$.

c. Dried at 300° F. by $(\underline{\overset{\cdots}{\mathrm{Al}}} + C_{12}H_5O_8 + 2HO) + 3\,(\underline{\overset{\cdots}{\mathrm{Al}}} + 2HO)$.

5. That when treated with nitric acid, the native mudesite, as

well as the mudesous acid itself, are oxidized and converted into a new brownish-yellow, soluble and deliquescent acid, containing more oxygen, and in the anhydrous state represented by $C_{12} H_5 O_{10}$.

6. That this new acid, the *mudesic*, combines readily with alumina and protoxide of mercury, giving salts of a yellow colour. Both the acids described in this paper are distinguished for their tendency to precipitate alumina and the protoxide of mercury. The mudesate of mercury dried at 300° F., is represented by $(2 H_9 O + C_{12} H_5 O_{10})$.

7. That chlorine, when made to act on either of the acids, or their salts of alumina in contact with water, gradually deprives them of all colour, while, at the same time, muriatic acid is formed. Collected on the filter, boiled in water till the washings cease to precipitate nitrate of silver, and dried, the white gelatinous, apparently altered mudesite or mudesate, is found on analysis to contain no atomic proportion of chlorine, but to have sensibly the constitution of the mudesic acid, or mudesates prepared by the direct action of nitric acid. The author thinks it not unlikely that a chloro-mudesic acid exists, and may be formed during this process, represented probably by $C_{12} H_4 Cl O_{10}$, but which he has not succeeded in obtaining in a separate state.

The mudesous and mudesic acids are distinguished from each other by giving, the former brown, and the latter yellow precipitates with the neutral metallic salts—by being the former unaltered, and the latter deliquescent in the air. Both form deliquescent salts with ammonia, and appear to undergo alteration by the long-continued action of hydrosulphuric, or of concentrated sulphuric and hydrofluoric acids.

7. On the Constitution of the Resins, Part V. By James F. W. Johnston, Esq., M.A., F.R.S.

In this paper the author continues his examination of what are called the fetid resins, and from repeated analyses deduces for the resin of Sagapenum the formula $C_{40} H_{29} O_9$, and for that of Galbanum $C_{40} H_{27} O_7$. He then compares the formulæ for the four resins:

Opoponax $= C_{40} H_{25} O_{14}$, Assafœtida $= C_{40} H_{26} O_{10}$,
Galbanum $= C_{40} H_{27} O_{70}$, Sagapenum $= C_{40} H_{29} O_9$;

and considers it probable that, though no striking analogy among the *irrational* formulæ for these resins is perceptible, by which their analogy in physical properties can be accounted for, that they may possess an analogous *rational* constitution, which future researches may disclose.

Euphorbium consists of two resins, of which the more soluble, A, gave the formula $C_{40} H_{31} O_6$. Elemi also consists of two resins, of which the more soluble, A, is represented by $C_{40} H_{32} O_4$, and the less soluble, B, by $C_{40} H_{32} O_1$, as had previously been shown by Hess and Rose. The Bdellium of commerce contains much gum, and a resin $C_{40} H_{31} O_5$.

The resin of Benzoin presented peculiar difficulties when submitted to investigation, from the ease with which it undergoes de-